Disclosure of interest The author has not supplied his declaration of conflict of interest.

http://dx.doi.org/10.1016/j.rehab.2015.07.064

CO02-004-e

Neurocognitive bases of tool use

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Tool use is a defining feature of human species. So, the issue of the underlying neurocognitive bases should be at the heart of psychologists' and neuroscientists' concerns. Yet, since the beginning of scientific psychology in the late 20th century, this issue has received very little interest. One potential reason for this lack of interest is the profound belief that tool use is first and foremost based on sensorimotor knowledge about how to use tools, as if tool use did not require any intellectual or reasoning skills, but only the hands. This belief has inspired, and still does, the major neuropsychological models of apraxia of tool use. This talk aims to describe the main recent advances in psychology and cognitive neurosciences that have contributed to revise the idea that manipulation is central to tool use, and have led to the formulation of new theoretical models suggesting that specific reasoning skills are involved in tool use. I will present the theoretical framework useful for the two other talks of this session, which will be further concerned with the issue of how to assess tool use disorders in brain-damaged patients (e.g., stroke, Alzheimer's disease).

Keywords Apraxia; Tool use; Gesture; Action

Disclosure of interest The authors have not supplied their declaration of conflict of interest.

http://dx.doi.org/10.1016/j.rehab.2015.07.065

CO02-005-e

Apraxia of tool use: Assessment strategies

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A substantial proportions of patients with brain damage and neurodegenerative diseases misuse common tools. However, this neuropsychological syndrome affecting everyday life is relatively unexplored in the field of experimental and clinical neuropsychology. Little is known about long-term evolution and specific evaluation and/or rehabilitation. This is partially due to the fact that apraxia of tool use faces the lack of an integrative theoretical framework taking into account all cognitive processes underlying gesture orientation, object selection or action sequencing. Indeed, apraxia of tool use goes far beyond the traditional, obsolete, distinction between ideational apraxia and ideomotor apraxia. This is a complex symptomatology requiring a conceptual and clinical differential analysis. After a brief overview of the theoretical principles underpinning our evaluation method, the purpose of this presentation is to describe the various types of tests, which are required to exhaustively assess tool use disorders. In that sense, we want to reemphasize the importance of preliminary neurological examination as well as the exploration of language, body schema (probably involved in imitation disorders) and motor sequences (unilateral, limb-kinetic apraxia). We will then focus on tool use assessment: types of object, basic knowledge related to them, presentation modalities, action planning. Finally, we illustrate our approach with studies in patients with left brain damage.

Disclosure of interest The authors have not supplied their declaration of conflict of interest.

http://dx.doi.org/10.1016/j.rehab.2015.07.066

CO08-001-e

Developmental dyspraxia: Symptom or real "dys" disorder?

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Just like all the others specific learning disorders, dyspraxia is a key issue for public health and school performance. "Developmental dyspraxia" qualifies specific disturbances of gesture, i.e. the ability to produce a finalized action (goal-directed movement) and to use the objects [1,2]. Even if dyspraxia was described for decades, the value of the concept for diagnosis raises some debates in the international literature. Since 1994, a consensus has been established on the diagnostic entity of Developmental Coordination Disorder (DCD) to describe all children who exhibit developmental deficits of "motor coordination". Beyond the usual debate of terminology, both the theoretical and the clinical definitions of the gestural dysfunctions in children remain insufficient in various respects. This communication provides a review of current controversies regarding the field of dyspraxia and DCD. Understanding the two entities of dyspraxia and DCD proves problematic, both when defining the concepts of praxis/motor coordination and when providing a theoretical analysis of the deficits they cover. More specifically, we aim at exploring the arguments supporting the hypothesis of a specific deficit in praxis development. We discuss the respective contributions of different impairment levels highlighted by studies of developmental gestural impairment (e.g. knowledge, executive functions, perceptive abilities...). Such a deconstruction of the concept of a specific deficit in praxis development argues in favor of an analysis that does not confuse gestural problems with other deficits made apparent through gesture.

Keywords Developmental dyspraxia; Developmental coordination disorder; Gesture; Children